A STUDY OF VARIOUS FORMS OF PROSTATIC HYPERTROPHY FROM POST-MORTEM SPECIMENS AND BY THE CYSTOSCOPE, WITH REFERENCE TO OPERATION.

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THE increasing amount of interest directed towards the prostate with reference to operative treatment, either by the galvanocautery instruments or by the partial or complete enucleation methods, through the perineum, over the pubes, or both routes combined, requires as much knowledge of the gland as possible for the purpose of choosing one or the other of these various operative methods.

Watson ("Treatment of the Hypertrophied Prostate," 1888) pointed out that it was possible to enucleate two-thirds of all hypertrophied prostates through the perineal route alone; the remaining third, because of an elongated prostatic urethra caused by intravesical growth or large median lobe hypertrophy, was best removed over the pubes or by the combined suprapubic and perineal route.

Since this time certain tractors—de Pezzer's, Syms's, Delbet's, Lydston's, Young's, and Packard's, by which the gland is rendered more accessible through the perineal incision,—have made a larger proportion of the cases suitable for perineal enucleation.

Despite the fact that a large proportion of the hypertrophied glands may be removed through the perineal incision, there are still strong advocates of the suprapubic route. Freyer (*Lancet*, 1904, clxvii, p. 197) demonstrates conclusively that the time-honored operation of Belfield and McGill still preserves its usefulness. Likewise does Alexander (*New York Medical Record*, 1894) give evidence that the combined opera-

tion is followed by good results. Freudenberg (*Deutsch. med. Zeit.*, 1900, Nos. 1 to 6) presents convincing evidence in favor of the Bottini operation; while White (ANNALS OF SURGERY, 1904, Vol. xl, p. 782) shows that castration still has a following. With so decisive a difference of opinion between foremost surgeons of the world in this branch of surgery, it is obvious that we have not as yet become convinced that there is a single operative procedure *par excellence.*

That this difference of opinion should exist may be grounded upon the operative skill of the different surgeons with regard to the special methods with which they are familiar. It may be true, also, that the successful cases operated by any of the various methods would do equally well by another method; or it may indicate that no one operative procedure is suitable for all cases.

The preference of the perineal route by Albarran, Proust, and other Frenchmen, supported by Gouley, Watson, Goodfellow, and others in America, while the English maintain a preference for the suprapubic route, resembles not a little the controversy over the high and the low cutting for stone in the early part of the eighteenth century.

If there is to be further progress in treating the malady, hypertrophied prostate, it seems to the writer that it will depend not only upon the publications of results by the different operative methods, but also by studies of the forms of the hypertrophies with a hope of determining which of the already perfected methods are to be chosen, and if no one appears suitable for the majority of cases, which should be chosen in any given case. It is with this in view that the following study and facts are presented.

Keyes ("Genito-Urinary Diseases," 1903, p. 253), in considering the cases recorded by Thompson, Prédal, Desnos, Motz, and Watson, concludes that eighty-four out of every 100 cases of prostatic hypertrophy may be diagnosed by rectal palpation. He does not, however, by this means attempt to distinguish the part or parts of the gland which cause the obstruction, which fact may be the important element to be

considered in choosing one or another method of operative treatment.

The relative frequency of the enlargement of the different portions of the prostate has been recalled by Thompson, Dittel, Watson, and others. The form of the growth varies, and the different varieties occur in the order of frequency, as follows: 1. An enlargement of the two lateral lobes, together with an enlargement of the so-called third, or middle, lobe. 2. Enlargement of the median lobe alone. 3. Enlargement of the lateral lobes alone. 4. Enlargement of the median and one lateral lobe. 5. Growths occurring in the form of independent, discrete tumor nodules, situated most frequently along the course of the prostatic urethra, and less commonly on the vesical surface of the gland. There may be hyperplasia of the prostatic tissue, so as to produce a combination of any of the above-mentioned conditions. They are, however, but combinations of the above conditions and hardly justify further classification.

The cystoscope is the only means by which the exact character of the obstruction may be learned, and while perhaps it is more commonly used to determine whether or not the given gland is suitable for the Bottini operation, it also serves as an important means by which the intravesical character of the gland may be studied, and thereby determine the nature of the obstruction and aid in determining which route should be employed in a more radical operation.

The interpretation of the size, shape, and contour of the gland, and the character of the vesical orifice, requires more experience for correct interpretation than probably any other given element in the field of cystoscopy. An exact knowledge of the topography of the prostate, for performing the Bottini or the more uncommon galvanocautery operations, is the fundamental step in the procedure, without an exact knowledge of which these operations are not only dangerous, but unjustifiable.

THE CYSTOSCOPIC INSTRUMENTS.

No mention will be made of the simple direct convex diagnostic cystoscopes or those employing air as the examining

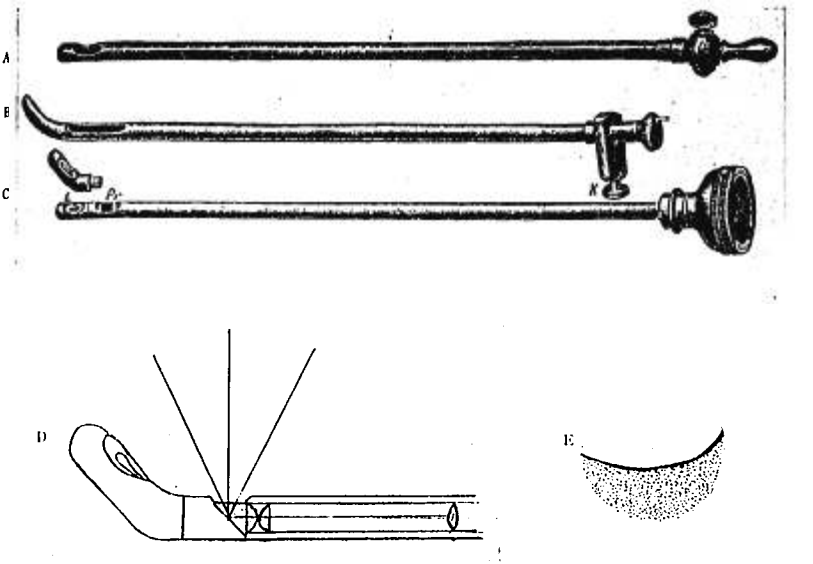


FIG. 1.—Kollmann's Simple Indirect Concave Diagnostic Cystoscope.

A. The irrigating tube introduced into the sheath, B, during the introduction of the sheath into the bladder and through which the bladder is irrigated.

B. Sheath which contains the irrigating tube, A, during introduction and which receives the cystoscope, C, with the straight lamp. The device, K, at the proximal end is a sliding-valve for the purpose of holding the examining medium in the bladder during the removal of the irrigating tube, A, and the insertion of the straight cystoscope, C.

C. Shows the cystoscope fitted with the straight lamp for use; within the above is a cane beak which is secured into the shaft, where the bladder urine is carried on through a catheter.

D. Shows the optics of the simple cystoscope. The field of vision is at a right angle to the long axis of the instrument's shaft.

E. Shows a single cystoscopic field of a normal prostate.

medium, experience having proven them inferior to the simple indirect concave diagnostic instruments and the retrograde cystoscopes using water as the distending medium.

The principles and advantages of the cystoscopes best adapted for the diagnosis of prostatic hypertrophy will be briefly mentioned.

With the *Simple Concave or Indirect Diagnostic Cystoscope*, the field of vision is at right angles to the long axis of the instrument's shaft, the light being deflected ninety degrees by the large rectangular prism forming the window (Fig. 1). The posterior and lateral walls of the bladder are easily examined, but to view the anterior wall the ocular end of the cystoscope must be depressed as far as possible, and to bring the base and vesical outlet into view the instrument must be withdrawn until the prism is on the edge of the vesical orifice. By keeping the window of the cystoscope on this level, depressing and elevating the ocular end of the instrument, and at the same time rotating the beak, pushing it inward and drawing it outward, the whole of the prostate may be inspected.

No one of the simple concave indirect diagnostic cystoscopes is especially adapted for the study of the prostate. The simple cystoscope of the Nitze or Leiter pattern is perhaps, on the whole, less desirable than those possessing in addition an irrigating sheath, which may be used if the presence of blood or pus necessitates a rapid examination, or if there is difficulty in passing an instrument into the bladder.

An instrument of this sort is Kollmann's (Fig. 1). (*Cent. f. d. krankh. d. Harn. u. Sex. Org.*, Leipzig, 1900, xl, 393–402, and *Cent. f. Chir.*, Leipzig, 1900, xxvii, 1058–1060.) This instrument, antedated in principle by Gueterbock, and followed in principle by a Nitze instrument and a cystoscope by Lang, combines the simple cystoscope with the most satisfactory arrangement for removing and replacing the examining medium, and for irrigating the bladder in those cases in which it is especially foul or difficult to instrument.

The Retrograde Cystoscopes.—Nitze, in his cystoscopic production of 1887, considered it necessary to have three in-

struments for the purpose of rendering possible a complete visual examination of the bladder. These instruments are known as the Nitze cystoscope, No. 1, No. 2, and No. 3. The No. 1 has the lamp and prism on the concave surface, and has served as a model for the simple diagnostic cystoscopes of to-day. The No. 2 has the lamp and prism on the convex surface, and was for the purpose of examining the bladder fundus. This instrument does not concern us. Suffice it to say that it never had any practical value, the No. 1 instrument accomplishing the purpose for which the No. 2 cystoscope was intended.

Nitze's No. 3 cystoscope (Fig. 2) was intended by him to be a retrograde cystoscope, that is, to look directly backward towards the operator, bringing into view the base of the bladder and the vesical outlet. This instrument was the first of the retrograde cystoscopes, and fails, as a desirable instrument for examinations of the prostate and vesical outlet, because the visual arc falls short of the instrument's shaft, thereby giving no landmark for orientation.

Nitze, after the appearance of the retrograde cystoscopes of Young and Schlagintweit, produced another retrograde cystoscope involving the principle of the latter's instrument. By placing the beak at a nearer right angle with the shaft, the visual arc is made to include the edge of the instrument's shaft (Fig. 3).

Young, in 1900 (a date prior to the second Nitze and the Schlagintweit retrograde cystoscopes), designed, and had constructed by Hirschmann, a retrograde cystoscope, which, employing a double prism with two reflecting surfaces, enabled the operator to look directly backward onto the instrument's shaft (Fig. 4). (Meeting of the American Association of Genito-Urinary Surgeons, May, 1893.) Objection has been made to the hump on the convexity at the site of the lens, and the instrument has not found general favor.

The instrument which is unique in the class of retrograde cystoscopes is the *Schlagintweit instrument* (*Ann. d. Mal. d. Organ. Genito-Urin.*, Paris, 1803, xxi, 874-980). It is con-

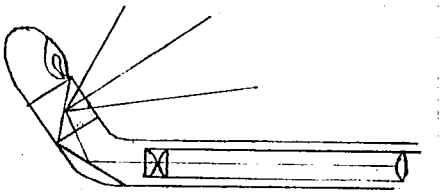


FIG. 2.—Nitze No. 3 Retrograde Cystoscope of the 1887 pattern.

Note that the beak is at an almost right angle with the shaft of the instrument. Note also that the field of vision does not include the instrument's shaft. The image after passing through the prism is deflected backward by a mirror (*m*).

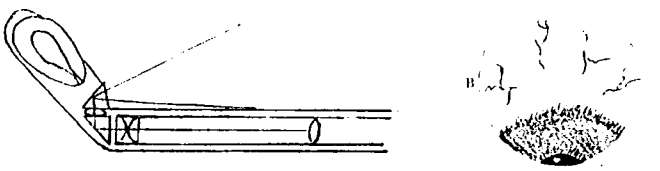


FIG. 3.—Nitze's new Retrograde Cystoscope.

A. Note that the field of vision includes the instrument's shaft. Note that to accomplish this two prisms are employed.

B. The cystoscopic field. Note the shaft of the instrument at the lower edge of the field; above the prostate, and above that the bladder wall.

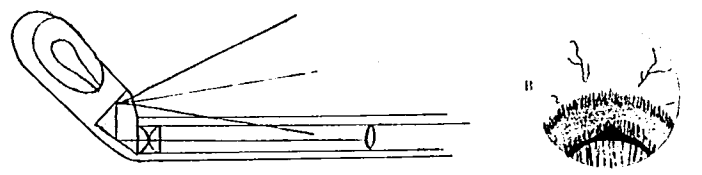


FIG. 4.—Young's Retrograde Cystoscope.

A. Note that the instrument's shaft is within the field of vision, and that this is accomplished by a single prism with two reflecting surfaces. Note the clumsy hump made by the prism.

B. A cystoscopic field. The shaft of the instrument seen at the lower edge; above prostate and bladder wall.

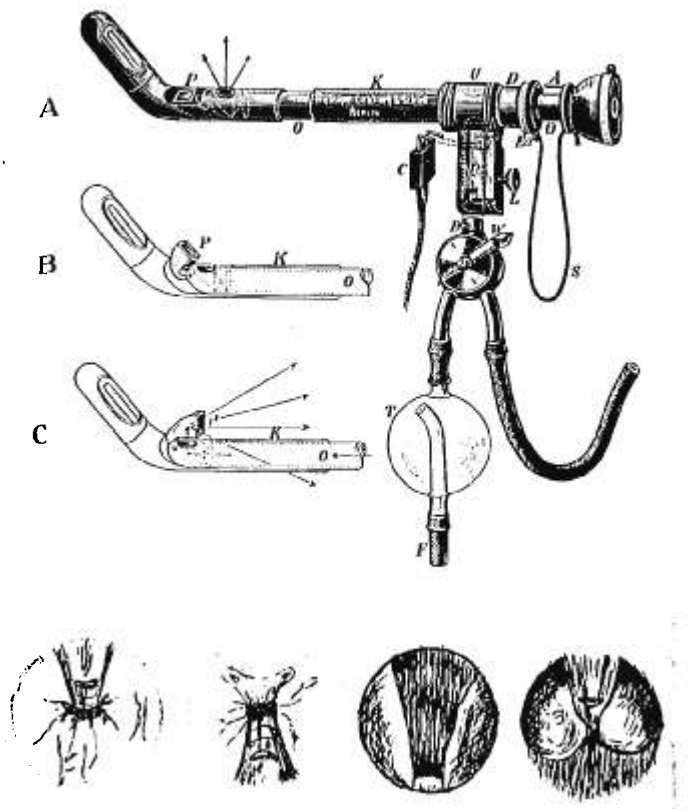


FIG. 5.—Schlagintweit's Retrograde Cystoscope.

A. Represents the instrument as a whole; the prism (*P*) being within the shaft makes the instrument essentially a simple, indirect diagnostic cystoscope.

B. Shows the prism (*P*) partially forced out of the shaft.

C. Shows the prism (*P*) in position to examine the vesical outlet and vesical surface of the prostate and bladder base.

D. In the first two figures the shaft of the instrument is visible, presenting through the bladder orifice; the prism being high within the bladder, the base of the viscus is evident. In the second two pictures the shaft is also visible, but the prism being nearer the vesical outlet the prostate occupies the field of vision.

structed upon a fundamental plan which is common to the new cystoscopes of Reiniger, Gibbert, and Schall for the ureter and electrolytic operations (Fig. 5).

Retrograde views with this instrument are rendered possible by a reflecting prism (*p*, Fig. 5, A), which is constructed upon a movable joint at the extremity of the optic tube (*o*), which tube glides into the interior of the outer tube (*k*). By pushing forward the tube (*o*), the prism (*p*) is thrown up forward, and assumes the position as in Figs. 5, B and C. The rays are transferred for a second time perpendicularly, so that one sees in the direction held by the shaft, that is, directly backward. By drawing back the optic tube (*o*), so that the prism is in the position as in Fig 5, A, the instrument may be used as any ordinary, simple, diagnostic cystoscope.

The section containing the bulb (*T*), with the neck-piece (*A*), is attached to the shoulder (*U*), and the optic tube being withdrawn to the exterior of the cord (*S*) allows the fluid from the bladder to run out into the bulb (*T*) when the valve is opened by the lever (*W*). Irrigation through the tube (*J*) from a reservoir is alternated with evacuation into the bulb (*T*) by turning the lever alternately one way or the other.

The optic tube being returned to a position for an ordinary or retrograde view, the attachment with the battery is made through the electrical plugs (*C*) by placing them in position as indicated in Fig. 5, A.

None of the retrograde cystoscopes can be commended as accomplishing all that might be desired. In order to bring all parts of the vesical orifices into view, these instruments must be made to assume from four to eight different positions, and in this they possess no advantage over the simple cystoscopes. The images received by the eye are inverted, and, as with the simple cystoscope, must be transposed by the examiner before the actual shape of the bladder outlet is pictured. Again, a large intravesical projection cannot be seen as a whole, and the interpretation of the fields necessary to cover it are more difficult to compile than are the images received when employing the simple cystoscope. The optics of the retrograde cystoscopes

being more complicated than those of the simple diagnostic instruments, render the object less distinct, much light being lost by the double reflection through the two large prisms.

It is necessary in every examination to employ a simple diagnostic cystoscope to study the bladder. Schlagintweit, appreciating this fact, and also the inconveniences of having both a retrograde and a simple cystoscope ready for each examination, has ingeniously embodied both principles in one instrument, as already noted. This combined instrument, however, when used as a simple diagnostic cystoscope, is less satisfactory than one of the regular simple cystoscopes because of its complicated optics, whereby much light is absorbed in the transmission of the object. The mechanics of the Schlagintweit instrument, although not unnecessarily complicated, still possess delicate features which get out of order easily. This is especially true of the sliding prism.

Suprapubic Cystoscopes.—There is a small class of cases in which it is impossible to make the simple cystoscope enter the bladder. Prostates which bleed sufficiently to continually smear the window of the cystoscope in its passage, and in which cases it is necessary to learn the contour of the gland in anticipation of a Bottini operation or otherwise, suprapubic cystotomy may be indicated.

Kennedy, in 1894 (*New York Medical Record*, 1902, lxi, p. 610), devised a suprapubic cystoscope which consisted of a large trocar made to fit a 21 F. Otis endoscope. The bladder was emptied through the trocar and washed clean. A lamp was attached to the endoscope tube and, while the bladder was empty, its surface was examined.

Kraske, in 1902 (*Cent. f. Chirurg.*, Leipzig, 1803, xxix, 153–155), describes examinations of the bladder through suprapubic fistulæ which sometimes exist after suprapubic operations. The information gained in this manner caused him to make a trocar cystoscope, which he used in the class of cases already spoken of.

Soon after the appearance of Dr. Kraske's article, Fenwick published (*British Medical Journal*, March 29, 1902, p.

772), referring to his work upon the subject ten years previously, and the suprapubic cystoscope which he devised for the purpose at that time ("Epitome of Urinary Surgery," 1894, p. 82). (Fig. 6.)

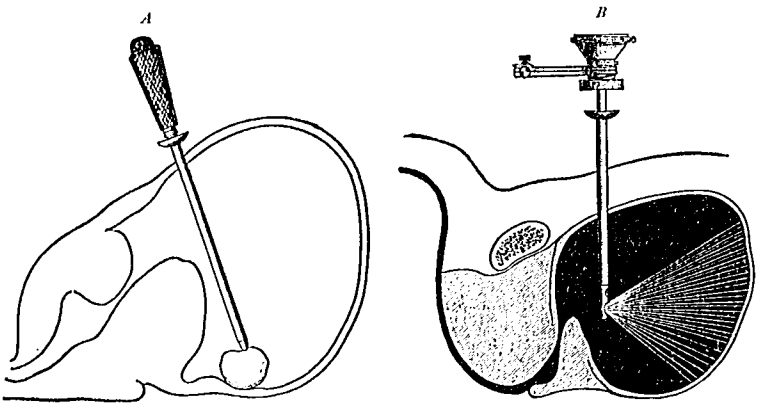


FIG. 6.—Fenwick's Suprapubic Trocar Cystoscope. *A* shows the trocar in position and the method of sounding the *bas fond* with a blunt pilot. *B* shows the cystoscope introduced through the trocar cannula.

In this class of cases where the enlargement of the prostate is so obstructive or vascular, and where symptoms lead one to believe that a stone may be situated in a deep *bas fond*, suprapubic sounding and cystoscopy through a cannula, as advised by Fenwick, are indicated with local anæsthesia. The trocar and cannula are made to enter the distended bladder through the space of Ritzius. The trocar, being removed from the cannula, is replaced by a loosely fitting, blunt instrument, by means of which the *bas fond* may be sounded for stone.

The cystoscope can be introduced, through the cannula, into the bladder, which may be examined after having been cleaned and distended with clear water. In such cases in which suprapubic sounding and cystoscopy revealing stone, new growths, or prostatic conditions requiring suprapubic cystotomy, the trocar may serve as a director in performing the operation.

The information gained by suprapubic sounding and cystoscopy averts the more serious procedure of suprapubic cystotomy as an exploratory measure, and, considering that the indications for such procedures are in the aged, in the majority of cases, the importance of suprapubic cystoscopy is obvious.

The interpretation of the picture which is revealed by suprapubic cystoscopy will at first be difficult to those familiar with the examination through the urethra. Although one may search directly for such landmarks as the bladder outlet, the trigone, and the ureteral orifices, their appearance from a different point of view is not always easy to recognize.

THE STEPS IN THE EXAMINATION AND THE POINTS TO BE DETERMINED BY THE EXAMINATION.

The prostatic urethra is a pliable tube which may be altered in its length, size, and shape. Such changes are demonstrable by three distinct steps in the examination: (1) The passage of the cystoscope into the bladder; (2) observing the appearance of the bladder outlet, and (3) by bimanual examination with the cystoscope, or the writer's special instrument, in the bladder and the finger in the rectum.

The study of the prostate by the cystoscope should in each case be directed towards learning the various points, as follows: 1. The obstructing portion of the gland. (Nodulous growths projecting into the prostatic urethra; compression of the prostatic urethra by one or both lateral lobes; by a middle lobe; or by any combination of these together.) 2. The condition of the remaining portion of the bladder and the ureteral orifices. 3. The comparative size of the various lobes, especially those producing the obstruction. 4. The length of the prostatic urethra.

These points are best gained by the simple, concave, indirect diagnostic cystoscope with a Mercier beak, although it may be of occasional interest to use one of the retrograde instruments, especially Schlagintweit's, to study the topography of the vesical surface of the gland. It is less frequently of

advantage to use one of the irrigating cystoscopes because of foul cystitis. In such instances an instrument of the Kollmann type is to be preferred to the ordinary irrigating cystoscopes, the irrigating tubes of which are too small to be of service in removing the foul material. When the cystoscope cannot be made to enter the bladder, or when bleeding occurs from such attempts, it becomes necessary, in certain cases, to resort to suprapubic cystoscopy, as practised by Fenwick, Kraske, and Kennedy.

Taking a case of the largest class, that is, one in which the bladder may be entered and irrigated through a small rubber catheter or coudé, and in which the simple, concave, indirect cystoscope is used to the greatest advantage, we may proceed with the examination, attempting to gain information upon the various points already enumerated.

The technique and results remain essentially the same with the retrograde or the irrigating cystoscopes of either type, but in suprapubic cystoscopy only such information is obtained regarding the obstruction as may be shown by intravesical conditions of the prostatic surface and distortions of the bladder outlet.

1. *To Learn the Site of the Obstructing Portion of the Gland.*—This is accomplished by the three steps in the examination, as follows: (1) The passage of the cystoscope into the bladder; (2) observing the appearance of the bladder outlet; (3) bimanual examination with the cystoscope in the bladder and the finger in the rectum.

In using either the simple diagnostic, the retrograde, or the irrigating cystoscope of either type fitted with a short Mercier's beak, the instrument is passed to the tip of the prostate. The ocular end is then gently depressed as far as possible before the beak will enter the prostatic urethra. In cases which have been leading a catheter life, the beak of the instrument will frequently be caught in a urethral pouch behind, or, less frequently, in front of the apex of the prostate, which projects into the urethra, not unlike the cervix into the vagina. When this condition is encountered, the succeeding attempts to

enter the bladder should be systematically as follows: withdraw the cystoscope for an inch or two and, depressing the ocular end, make the beak travel on the roof of the urethra. In the majority of cases this will insure a successful result. If, however, it fails, withdraw the instrument again and proceed with the beak on the floor. This failing, another attempt is made, using care to make the tip of the beak strike a point midway between the two previous ones. This failing, the attempts are repeated with great gentleness, carrying the instrument slightly to the right and left, and varying the degree of depression of the ocular end. The finger in the rectum will often facilitate these movements.

The beak having entered the prostatic urethra, the operator holds the instrument by the ocular end, lightly between the thumb and forefinger, and, watching the indicating knob, gently forces the cystoscope through the prostatic urethra, noting any deviation of the beak to the right or left, or any increased resistance, unevenness, or jerks in the course of its passage into the bladder.

Careful observations of these points should give the first suspicions as to the probable condition to be found by inspection. The beak being turned to the right suggests encroachment upon the urethra from the left side, while temporary rotation and increased resistance over a small area during its passage through the prostatic urethra makes the presence of an obstructing nodule most probable. Any such physical signs are confirmed by the visual inspection, and in withdrawing the instrument with the finger in the rectum at the end of the bimanual examination.

The cystoscope being in the bladder, the topography of the vesical surface of the gland is to be studied, and such hypertrophies or distortions of the vesical orifice as are present noted.

Each picture of a single cystoscopic field is but a single inverted segment, which, with the others, will go to make up the composite picture. The result will be more or less accurate according to the examiner's ability to interpret and compile

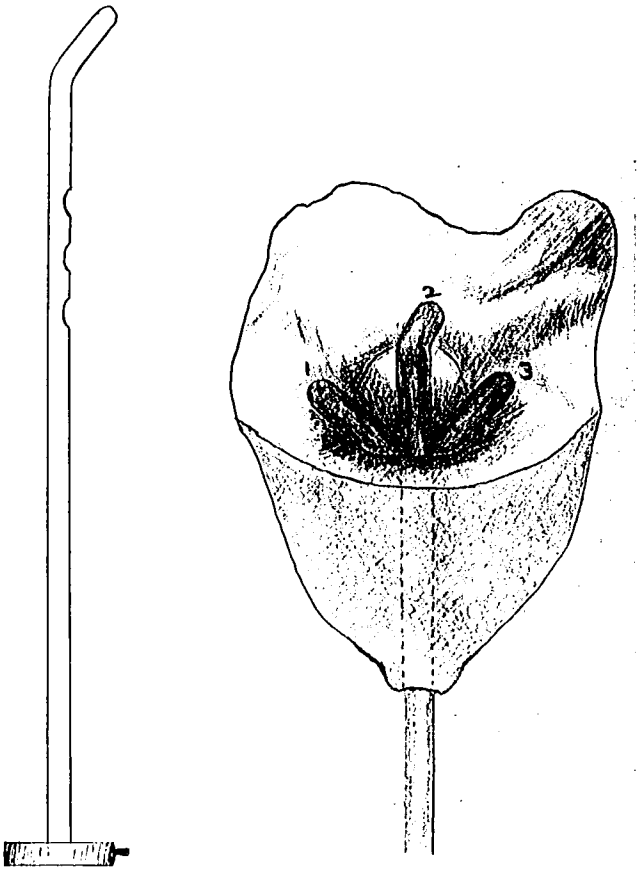


FIG. 7.—A. The writer's special instrument for determining the length of the prostatic urethra. It consists of a two centimetre Mercier beak, a shaft of twenty French which has three depressions: one, three centimetres from the point of union of the beak with the shaft; another, five centimetres, and another seven centimetres, each depression and interval between being one centimetre in length.

B. The method of determining the height and breadth of the intravesical projection of the median lobe. The drawing is from the specimen seen in Plate IV. The instrument is seen in three positions. Position 1.—The beak is in the urethral cleft at the right of the median lobe. By keeping the beak on the surface of the gland and rotating the instrument, the shaft will be drawn inward as the beak surmounts the intravesical elevation and assumes the position 2. The distance which it is drawn in is determined by counting of the grooves in the instrument's shaft. Further rotation will cause the beak to assume position 3. The distance from position 1 to position 3 is the width of the lobe, and can be more or less accurately estimated by noting the arc through which the beak passes in going from position 1 to position 3.

the inverted views received in the various fields necessary to cover the whole vesical surface of the gland.

While a small sessile or pedunculated middle lobe may appear as a distinct tumor projecting into the bladder, it is unusual that the larger forms of this type of hypertrophy are so easily determined; and even after demonstrating such a lobe, it is unjust to consider it the cause of the obstruction unless other evidence is at hand. Likewise the intravesical projection of the lateral lobes, as determined by the shadow cast by them upon the lighter colored bladder wall, is no certainty of their urethral obstruction.

While the peripheral border of the prostate should be traversed, and the degree of the intravesical projection of the various areas noted by the degree and depth of the shadows cast by them, and their relative position with the intraureteral bar and ureteral orifices, the all-important feature to be determined by the examination is the shape of the vesical outlet. In this is found the evidence pointing to one or more lobes, which, by compressing the prostatic urethra, impedes the flow of urine through it. Therefore, in determining the site of the obstruction, it is necessary to learn the shape of the vesical orifice, which becomes distorted according to the lobe or lobes encroaching upon it.

Bimanual Examination.—With a cystoscopic beak of known size, or the writer's special instrument, in the bladder and the finger in the rectum, the tissue posterior to the vesical orifice, the breadth of the lateral lobes, and the length of the prostatic urethra may be approximately estimated. The intravesical elevations may be learned by drawing the beak of the cystoscope snugly to the vesical orifice and rotating it. Such elevations are noted by the cystoscope being drawn inward as it ascends, and again outward as it descends the elevation during the rotation of the cystoscope over the prostatic surface (Fig. 7). Such areas are located and their breadth determined by observing the position of the indicating knob and the arc through which the beak travels from the time of its rise to its descent. These distinctive features, gained only

by bimanual examination, show the importance of practising this method of examination in connection with cystoscopy for the purpose of gaining information regarding the growth.

Bimanual examination serves chiefly to determine the approximate size of the parts of the gland; but it also confirms and gives more complete knowledge of the sites of the obstructing portions.

The Normal Prostate (Plate I).—The normal vesical orifice when distended is an almost circular, dimple-like depression about one centimetre at its greatest width, without furrows or markings demonstrable by the cystoscope (Plate I, A).

(1) *The Passage of the Cystoscope into the Bladder.*—An anterior urethra without constrictions admits of a free passage of the cystoscope to the anterior layer of the triangular ligament, where the instrument is arrested until the ocular end is depressed, which act causes the cystoscope beak to enter the prostatic urethra. As the instrument is gently pushed onward through the prostatic urethra, no increased resistance is felt, nor is the beak deviated to one side or the other.

(2) *Observing the Appearance of the Bladder Outlet.*—The light being turned on, the cystoscope is drawn outward until the vesical orifice comes into view. The prism is now on a level with the edge of the vesical outlet, and if drawn outward a little farther, so as to bury it in the urethra, no image will be received. The prism being on the proper level, the beak is made to point posteriorly, and by rotating the instrument the beak is made to traverse the circumference of the bladder orifice, and a series of inverted images in a direction at right angles to the instrument's shaft are seen (Plate I, C). This series of inverted images is recorded (Plate I, D). Plate I, E, represents the actual shape of the vesical orifice determined by transposing the inverted cystoscopic pictures of which (C) is an example.

(3) *Bimanual Examination, the Cystoscope in the Bladder, and the Finger in the Rectum.*—The electrical connections of the cystoscope being detached, the beak of the instrument is made to point posteriorly, and is drawn snug against the

PLATE II.

DOUBLE LATERAL LOBE ENLARGEMENT.

A. Photographed specimen. B. Mesial section of the prostate and cross-section of the urethra. C. The cystoscopic picture of the posterior cleft. D. Diagram of the different cystoscopic fields. E. The actual shape of the vesical orifice and urethra.

A. Hypertrophy of both lateral lobes of the prostate, with only a slight degree of intravesical projection and lengthening of the prostatic urethra. The urethra is dilated anteroposteriorly.

B. Mesial section of the double lateral lobe enlargement (specimen A), showing the anteroposterior dilatation of the prostatic urethra, with only a slight degree of intravesical projection.

C. The cystoscopic picture of the cleft formed posteriorly by the enlargement and intravesical projection of the lateral lobes. A similar cleft is seen anteriorly.

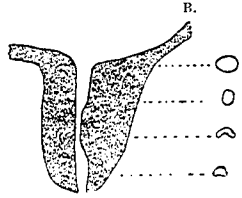
D. The diagrammatic record of the different cystoscopic fields of the vesical orifice, showing a cleft posterior, *a*, and anterior, *b*, with the remaining fields normal in shape, but slightly deepened by the increased size of the lobes.

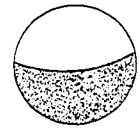
E. The actual shape of the vesical orifice determined by transposing the inverted cystoscopic pictures recorded in D, with the accompanying narrowing and lengthening of the prostatic urethra; the tissue posterior to the vesical outlet is diminished in thickness.

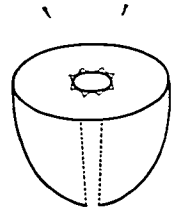
PLATE I.

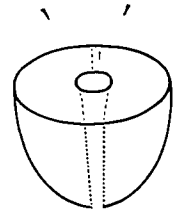
NORMAL PROSTATE.

A. Photographed specimen. B. Mesial section of the prostate and cross-section of the urethra. C. A normal cystoscopic field. D. A diagram of the different cystoscopic fields. E. The actual shape of the vesical orifice and urethra.









A. Normal prostate. Note the dimple-like depression and circular shape of the vesical orifice.

B. Mesial section of the normal prostate (specimen A), showing the projection of the verumontanum into the urethra and the shape of the normal urethra at different levels.

C. The cystoscopic picture of any portion of the normal vesical orifice.

D. The diagrammatic record of the different cystoscopic fields necessary to cover the circumference of the vesical orifice. (A series of cystoscopic pictures as C, a single segment.)

E. The actual shape of the vesical orifice determined by transposing the inverted cystoscopic pictures recorded in D.

vesical surface of the prostate. The rectal finger will determine a straight median raphe between the two lateral lobes, and is carried in turn laterally over the smooth, equal sized, nontender lateral lobes which are of normal consistency. The finger is now carried to the posterior superior edge of the prostate, where the cystoscope beak of known size is found, and the thickness of the tissue from the posterior edge of the vesical orifice to the posterior edge of the gland is approximately estimated and recorded, as in Plate I, E. With the finger in the median raphe the instrument is withdrawn, and, as the beak passes through the prostatic urethra, the rectal finger follows it, and an approximate estimate is made of the thickness of the tissue posteriorly through the length of the prostatic urethra. No increased resistance, jumps, or deviation of the beak will be noted. If it is desirable to determine the length of the prostatic urethra, the writer's special instrument, previously mentioned, should now be used.

Double Lateral Lobe Enlargement (Plate II).—When the lateral lobes cause the obstruction, the urethra is narrowed laterally and is lengthened anteroposteriorly. The course of the prostatic urethra is at the same time deviated to one side or the other, if the lateral hypertrophy of one lobe is greater than that of the other, so, instead of a straight urethra dilated anteroposteriorly, its course is also curved. There is an associated degree of intravesical projection of the lobes, and the prostatic urethra is lengthened. Distinct clefts are formed at the anterior and posterior ends of the slit-like urethra. The posterior one of which is seen in Plate II, C.

(1) *The Passage of the Cystoscope into the Bladder.*—There may be difficulty in entering the beak into the prostatic urethra. As it is pushed on, the beak may be deviated to one side or the other, according to the greater or less hypertrophy of one or the other lobes, but when the hypertrophy is equal, as in the case illustrated, there will be no deviation of the beak. If, as is sometimes the case, the anteroposterior dilatation of the upper portion of the urethra is so great as to allow some degree of rotation of the instrument's beak within it,

one may receive the false impression that the bladder has been entered. The inability to see anything after the light has been turned on may be the first cue to the true situation. The suspicion of this condition having been aroused, the ocular end of the instrument is depressed and gently pushed onward, causing the beak to traverse the anterior wall of the urethra into the bladder.

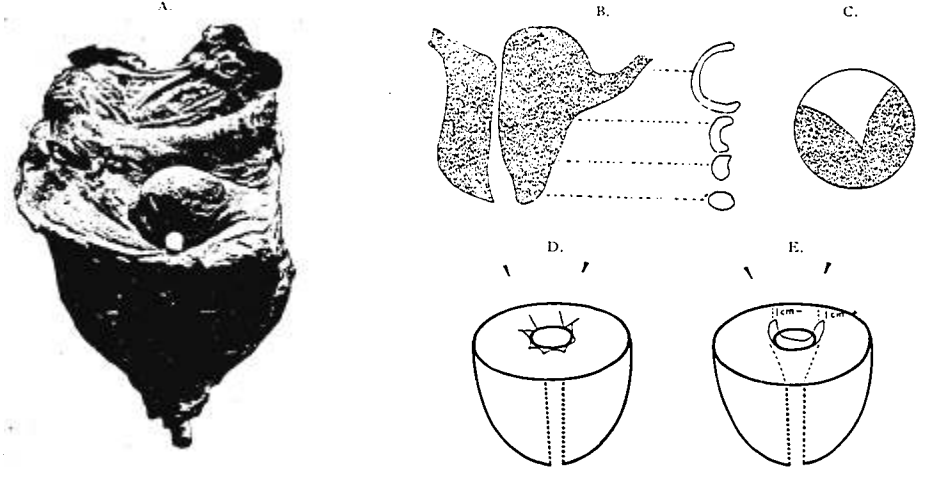
(2) *Observing the Appearance of the Bladder Outlet.*—The cystoscope being in the bladder, the vesical surface of the prostate is viewed. In the fields *a* and *b* of Plate I, D, the cystoscopic pictures as in Plate II, C, will be seen. The cleft at the posterior edge of the urethra will be the deeper. All such clefts enlarge and decrease in size as they are forced open or allowed to close by drawing the cystoscope outward or pushing it inward. This, together with the depth and relative position of the shadow cast upon the lighter colored bladder surface, gives some visual information regarding the degree of intravesical projection of the hypertrophied lobes, but should be corroborated by the more exact method of bimanual examination. The remaining cystoscopic fields are normal.

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—The cystoscope, or the writer's special instrument, is placed so that the beak points posterior and is drawn snug against the vesical surface. The rectal finger will find the median raphe pronounced, the convexity of the lateral lobes increased in size, less sensitive, and harder than normal; the tissue posterior to the vesical surface lessened or little increased over normal. The length of the prostatic urethra will be found increased. Keeping the beak of the instrument snug against the vesical surface of the prostate, it is made to rotate over each lateral lobe in turn. By noting the distance which the instrument is drawn inward as it passes over the intravesical projections of the lobes, and the arc through which the beak rotates in covering the elevated areas, some idea of the size of the intravesical projection is attained (Fig. 7). In withdrawing the instrument, the rectal finger,

PLATE IV.

MEDIAN LOBE ENLARGEMENT ALONE.

A. Photographed specimen. B. Mesial section of prostate and urethra. C. Cystoscopic picture of the left cleft. D. Diagram of the different cystoscopic fields. E. The actual shape of the vesical orifice and urethra.



A. Photograph of median lobe hypertrophy alone, showing the pedunculated intravesical growth and the semilunar shape of the vesical outlet. A rod is seen in the prostatic urethra, which is unopened. The laterally dilated urethra is seen to either side of the rod's tip.

B. Mesial section of the prostate and cross-section of the prostatic urethra at different levels. The mesial section shows the increased amount of prostatic tissue posteriorly and the intravesical growth forming a *bas fond*. Also the narrowing of the anteroposterior diameter of the urethra, the cross-section of which shows its lateral semilunar-shaped dilatation.

C. The cystoscopic picture of the cleft at the right of the pedunculation. A similar cleft is seen to the left side of the enlargement.

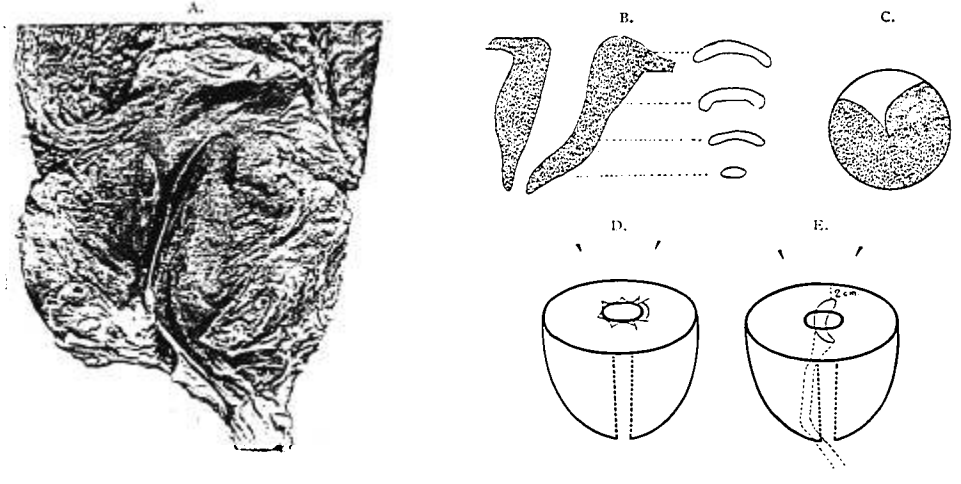
D. A diagrammatic record of the cystoscopic fields of the vesical outlet, showing a cleft a short distance to either side of the posterior median point, which area is occupied by the intravesical hypertrophy.

E. The actual shape of the vesical orifice determined by transposing the inverted cystoscopic pictures recorded in D, showing the lateral semilunar-shaped dilatation of the vesical outlet, due to the pressing forward of the posterior hypertrophy. The amount of prostatic tissue posterior to the clefts of the vesical outlet is lessened.

PLATE III.

ONE LATERAL LOBE ENLARGEMENT.

A. Photographed specimen. B. Mesial section of the prostate and urethra. C. Cystoscopic picture of the left posterior cleft. D. Diagram of the different cystoscopic fields. E. The usual shape of the vesical orifice and urethra.



A. Hypertrophy of one lateral lobe, deviating the course of the urethra to one side and dilating it anteroposteriorly, so that the cross-sections are semilunar in shape. The course of the urethra is marked by a straw. A is a large interurethral bar, and may sometimes be erroneously considered by the cystoscope as a median lobe.

B. Mesial section of the single lateral lobe enlargement with the prostatic urethra brought into a straight line, showing the anteroposterior dilatation. The cross-sections of the urethra show its semilunar shape, due to the unequal pressure upon the prostatic urethra from hypertrophy of only one lateral lobe.

C. The cystoscopic picture of the posterior cleft on the left side, showing greater intravesical elevation of the left lobe, which is the one producing the deviation of the urethra. A similar cleft is seen anteriorly also on the left of the median line.

D. The diagrammatic record of the different cystoscopic fields of the vesical orifice, showing a cleft posterior and anterior slightly to the left of a median line.

E. The actual shape of the vesical orifice determined by transposing the inverted cystoscopic picture recorded in D, showing the lateral narrowing, lengthening, and deviation of the prostatic urethra. The prostatic tissue posterior to the vesical outlet is a little increased.

following the instrument's beak, shows the tissue posterior to the urethra to be little, if any, increased, and usually lessened.

One Lateral Lobe Enlargement (Plate III).—When one lateral lobe is hypertrophied, it encroaches upon the urethra, distorting the vesical orifice, so that it assumes the shape of a semilunar slit, a cleft being formed at its anterior and posterior ends. The course of the urethra is deviated to one side (Plate III).

(1) *Passage of Cystoscope into the Bladder.*—The cystoscope beak will probably enter the prostatic urethra pointing in a direction opposite to the lateral lobe hypertrophied. During its passage into the bladder, the beak will deviate to the side opposite the hypertrophied lobe. Pressure of the lobe upon the cystoscope, which by its passage into the bladder converts the deviated urethra into a straight line, may be considerable and should be noted.

(2) *Observing the Appearance of the Bladder Outlet.*—The cystoscopic fields of the vesical outlet will show a cleft anteriorly and posteriorly, both on the same side as the hypertrophied lobe, and which clefts mark the ends of the semilunar shaped urethra (Plate III, B, D, E). The remaining fields are normal, except the one between the clefts, over the convexity of the encroaching lobe, which is convex outward.

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—The cystoscope beak pointing posteriorly and drawn against the vesical surface of the gland will probably slip into the posterior cleft. The rectal finger will find the median raphe ill defined because of the pronounced convexity of the hypertrophied lateral lobe. Differences in consistency and sensitiveness between the two lobes may or may not be evident. Rotation of the cystoscope, or the writer's special instrument, over the lobe will give an approximate estimate of the height and width of the intravesical elevation of the hypertrophied lobe. In withdrawing the instrument, the beak will be deviated in the same direction as during its introduction, that is, away from the hypertrophied

lobe, and the amount of tissue posterior to the urethra is usually increased.

Median Lobe Enlargement (Plate IV).—This form of hypertrophy, which, according to Albarran and Motz (*Ann. d. Mal. d. Organ. Genito-Urin.*, July, 1902), takes place from glandular tissue situated between the lateral lobes in the upper part of the prostatic urethra and called "the prespermatic group of glands," and those glands beneath the mucous membrane which Jones (*Virchow's Archiv*, 1894, cxxix, 224) has demonstrated as the beginning of such growths, encroach upon the urethra as well as growing upward into the bladder.

The growth into the urethra converts it into a U, the centre of which is occupied by the hypertrophied tissue, and on either side of which the urine is passed. These slits are seen by the cystoscope as clefts of varying size and depth according to the degree of the growth, and are located one on either side of the posterior median line (Plate IV, C, D, E).

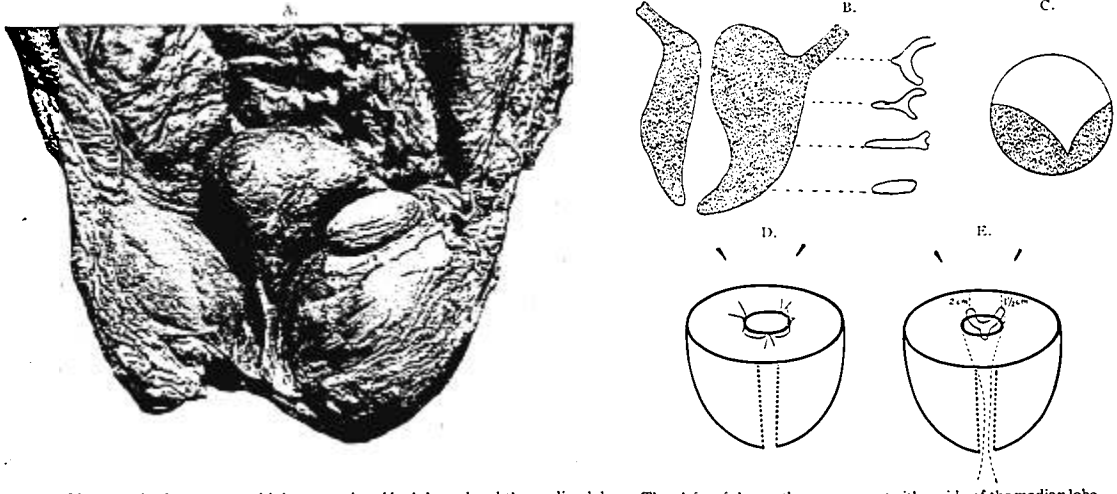
(1) *Passage of the Instrument into Bladder.*—The instrument in its passage through the prostatic urethra will remain in the median line until it reaches its upper part, where the beak, meeting the median obstruction, will rotate to one or the other sides of it, and thus enter the bladder through one of the clefts. The side to which the beak rotates is usually the larger cleft. By withdrawing the instrument to the point where the beak rotates back to the median line, it may be made to enter the bladder through the other cleft by rotating it slightly to the opposite side, as it is gently pushed inward towards the bladder. This is true only when the clefts are of nearly equal size. This will be clear by comparing Plates IV and VII.

(2) *Observing the Appearance of the Bladder Outlet.*—The cystoscope views will show a cleft on either side of a median posterior point, which clefts are situated at the ends of the U-shaped urethra (Plate IV, A, B, C, D, E). When the middle lobe is small, it is sometimes seen as a distinct tumor springing from the posterior edge of the prostatic urethra. The larger forms, owing to the limited fields of vision of the

PLATE VI.

ENLARGEMENT OF BOTH LATERAL LOBE AND THE MEDIAN LOBE.

A. Photographed specimen. B. Mesial section of the prostate and cross-section of the prostatic urethra. C. The cystoscopic picture of the left cleft. D. Diagram of the different cystoscopic fields. E. The actual shape of the vesical orifice and prostatic urethra.



A. Photograph of a prostate with hypertrophy of both lateral and the median lobes. The clefts of the urethra are seen at either side of the median lobe which extends into the urethra. The large, smooth surface on the lateral lobes is the opened urethra, and shows the large degree of anteroposterior dilatation present. Note that the projection of the median lobe makes the urethra Y-shaped, a cleft running to either side of the growth.

B. Mesial section of the prostate with cross-sections of the prostatic urethra. The mesial section shows the narrowing of the upper half of the urethra anteroposteriorly, due to encroachment of the median lobe. The lower half is dilated anteroposteriorly from the pressure of the enlarged lateral lobes. The cross-sections show the shape of the urethra at the different levels.

C. The cystoscopic picture of the right urethral cleft. A similar cleft is seen to the left of the median enlargement, and another in the middle anterior extremity of the urethra.

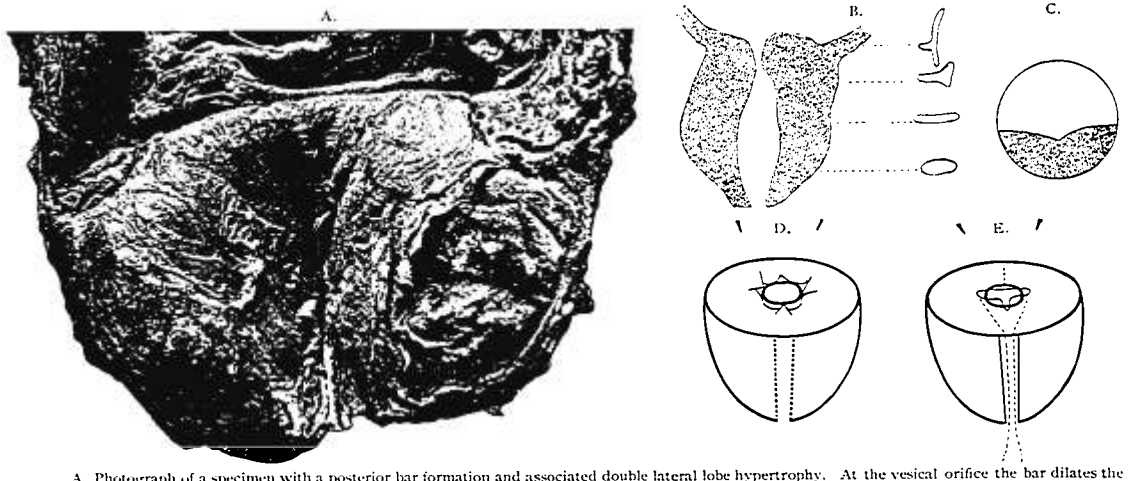
D. A diagrammatic record of the different cystoscopic fields of the vesical orifice, showing a cleft at either side of the posterior median line, which area is occupied by the median lobe, and also at the median anterior extremity of the vesical orifice, which is produced by the compressing lateral lobes.

E. The actual shape of the vesical outlet and prostatic urethra determined by transposing the inverted cystoscopic pictures recorded in D. The upper half of the urethra is dilated laterally and semilunar in shape; the lower half is dilated anteroposteriorly from the pressure of the bilaterally enlarged lateral lobes. The prostatic urethra is lengthened.

PLATE V.

ENCROACHMENT UPON THE PROSTATIC URETHRA BY A POSTERIOR BAR.

A. Photograph specimen. B. Mesial section of the prostate and urethra. C. Cystoscopic picture of the right cleft. D. Diagram of the different cystoscopic fields. E. The actual shape of the vesical orifice and prostatic urethra.



A. Photograph of a specimen with a posterior bar formation and associated double lateral lobe hypertrophy. At the vesical orifice the bar dilates the urethra laterally, while deeper in the urethra the pressure from the lateral lobes dilates it anteroposteriorly.

B. Mesial section of the prostate and cross-section of the prostatic urethra. The mesial section shows the narrowing anteroposteriorly of the upper part of the prostatic urethra due to the bar encroachment and its dilating anteroposteriorly below it, due to the lateral pressure of the hypertrophied lateral lobes. The cross-section shows the shape of the urethra at the different levels.

C. The cystoscopic picture of the small cleft at the junction of the posterior bar and right lateral lobe. A similar cleft is seen to the left end of the laterally dilatated urethra. There is also a cleft, rather deep, in the anterior median line, due to a slight degree of lateral lobe pressure upon the vesical orifice.

D. A diagrammatic record of the different cystoscopic fields of the vesical orifice, showing a cleft at either end of the laterally dilatated urethra, and also one anteriorly, due to slight pressure of the lateral lobes anterior to the posterior bar.

E. The actual shape of the vesical orifice determined by transposing the inverted cystoscopic pictures in D, showing the lateral dilatation of the urethra, due to the posterior bar, and also to the slight anteroposterior dilatation in the anterior portion of the vesical outlet from pressure of the hypertrophied lateral lobes. The prostatic tissue posterior to the vesical outlet is much increased. The prostatic urethra is lengthened.

cystoscope, can only be judged by the position of the clefts, the composite pictures necessary to cover the growth, and the degree and location of the shadow cast by it upon the lighter colored bladder wall.

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—In attempting to make the cystoscope beak point posteriorly and maintain a position upon the vesical surface of the gland, the beak will slide into one of the clefts at either side of the median enlargement. Unless the ocular end of the instrument is raised, the beak, if short, will be drawn into the urethra. The amount of tissue between the posterior edge of the cleft and the posterior border of the prostate should be carefully estimated, especially if a Bottini operation is to be performed, because, as seen, an instrument will by choice enter one of the clefts.

The rectal finger will often be unable to detect any median raphe because of its obliteration by the hypertrophied tissue immediately in front of it. The intravesical projection and width of the median lobe are determined by rotating the cystoscope, or the writer's special instrument, from one cleft over the growth and into the other as seen in Fig. 7, thereby gaining approximate estimations of the height and breadth of the intravesical projection. In withdrawing the instrument, the beak, which is turned to one side during its passage through the cleft, will rotate to the median line at the point in the prostatic urethra at which the median lobe ceases to encroach.

Posterior Bar Formation (Plate V).—In this condition the same tissue is hypertrophied as in the third, median, or middle lobe enlargement, the only difference being that the growth does not extend intravesically to such a degree. The vesical outlet is distorted into a transverse slit, but usually, as in the case illustrated, the lateral lobes are also enlarged, and dilate the urethra anteroposteriorly to a greater or less degree, which distortion becomes more evident below the bar encroachment, which is confined to the upper fifth of the prostatic urethra. Thus, upon entering the prostatic urethra with the instrument, there is considerable room anteroposteriorly until

the bar is reached, when the beak may be rotated almost 45 degrees, and enters the bladder with the beak almost transverse to the long axis of the body, or, being forced forward by the bar, will depress the ocular end of the instrument.

As in the case illustrated (Plate V, B, D, E), three clefts are evident, one at either end of the laterally dilated urethra, formed by pressure of the posterior bar, and one in the anterior median line from pressure of the lateral lobes.

(1) *Passage of the Instrument into the Bladder.*—The cystoscope beak will traverse the anteroposteriorly dilated urethra without deviation to one or the other sides until it reaches the posterior bar, where the short Mercier beak, striking the projecting bar, will be forced forward, and, if the vesical orifice is not too firmly pressed upon by the bar, will enter in the median line. If, however, the bar is large and the urethra much dilated laterally, the beak may rotate to an angle of 45 degrees to one side or the other, and enter the bladder through one of the lateral clefts. It is for this type of hypertrophy that the Mercier beak is especially adapted.

(2) *Observing the Appearance of the Bladder Outlet.*—The cystoscopic pictures received by rotating the cystoscope around the vesical orifice show three clefts, two laterally and one in the anterior median line (Plate V, B, D, E). Care should be taken not to mistake a large interurethral bar for hypertrophied prostatic tissue, as previously mentioned (Plate III). In a small contracted bladder, in which the interureteral bar is prominent, it is often difficult to differentiate the two, and the only safe guide will be the location of the urethral clefts.

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—The cystoscope beak, pointed posteriorly and drawn against the vesical surface of the prostate and the rectal finger looped over the posterior edge of the glands, will give evidence of the increased amount of tissue between the posterior edge of the urethra and the posterior border of the gland. The median raphe, in bar formation alone, may be absent; but as in the case illustrated, where the lateral lobes are also enlarged, the median raphe was distinct in the lower half of the gland.

Rotation of the instrument over the surface of the prostate shows but little elevation over the posterior and posterior-lateral segments. In withdrawing the instrument, the beak, although in the pronounced cases entering the bladder through one of the lateral clefts, may usually be withdrawn from the median line. It will be felt to slip backward as soon as the bar is passed, and, as in the introduction of the instrument, the beak will not deviate from the median line during the remainder of its withdrawal.

Enlargement of the Lateral Lobes and the Median Lobe (Plate VI).—When both lateral lobes and the median lobe are enlarged, the vesical orifice is Y-shaped. The hollow of the Y is produced by the growth of the median lobe forward, and the stem of the Y by the compression of the urethra from both sides. The stem is long or short, according to the greater or less degree of forward projection of the median lobe, or hypertrophy of the lateral lobes. Clefts are formed one on either side of the median lobe and one at the anterior end of the urethra. The prostatic urethra is lengthened, and at its upper end divided into two channels, one on either side of the median lobe, and which channels terminate as the lateral clefts of the vesical orifice. By studying the figures of Plate VI it will be evident that not only the vesical orifice is Y-shaped, but also the prostatic urethra itself.

(1) *Passage of the Cystoscope into the Bladder.*—The cystoscope beak will deviate to one side or the other during its passage through the upper part of the prostatic urethra; that is, when it arrives at the point of division of the urethra into the channels at the side of the median lobe. One channel is usually larger than the other, and is, therefore, the more natural course for the instrument to take. The presence of a channel on the other side of the median lobe may be demonstrated by withdrawing the instrument just below the point at which the deviation takes place, and, by turning the beak in the opposite direction, make it traverse the channel at the other side of the median lobe into the bladder.

(2) *Observing the Appearance of the Bladder Outlet.*—

The cystoscope will reveal three clefts, one on either side of the median lobe, usually large, and a somewhat smaller one at the anterior median point (Plate VI, A, C, D, E). Some idea of the intravesical projection of the median lobe may be obtained by observing the degree and location of the shadow cast by it upon the lighter colored bladder wall. The size of the median lobe cannot be judged by the number of fields necessary to cover it, because, if it projects into the urethra, as does the illustrated figure, most of the views will be taken with the cystoscope in one of the other clefts, and the lobe may at the same time be pushed to one side by the cystoscope's shaft.

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—With the beak of the instrument pointing posteriorly and drawn onto the vesical surface, it will be situated in one of the clefts at either side of the median lobe. The amount of tissue posterior to the urethra from the posterior edge of these clefts is slightly increased. The rectal finger will, as a rule, fail to detect any median raphe because of the hypertrophy of the tissue posterior to the urethra. The enlarged lateral lobes are hard and not sensitive. The length of the prostatic urethra will be found increased. By rotating the cystoscope, or the writer's special instrument, over the vesical surface of the prostate, the degree of elevation and the breadth of the median lobe and of each lateral lobe may be approximately estimated. In withdrawing the instrument, the beak will deviate to one side of the median enlargement, and will remain so until it passes the lowest point of the median encroachment, where it will be held in the median line if the two lateral lobes are equally hypertrophied.

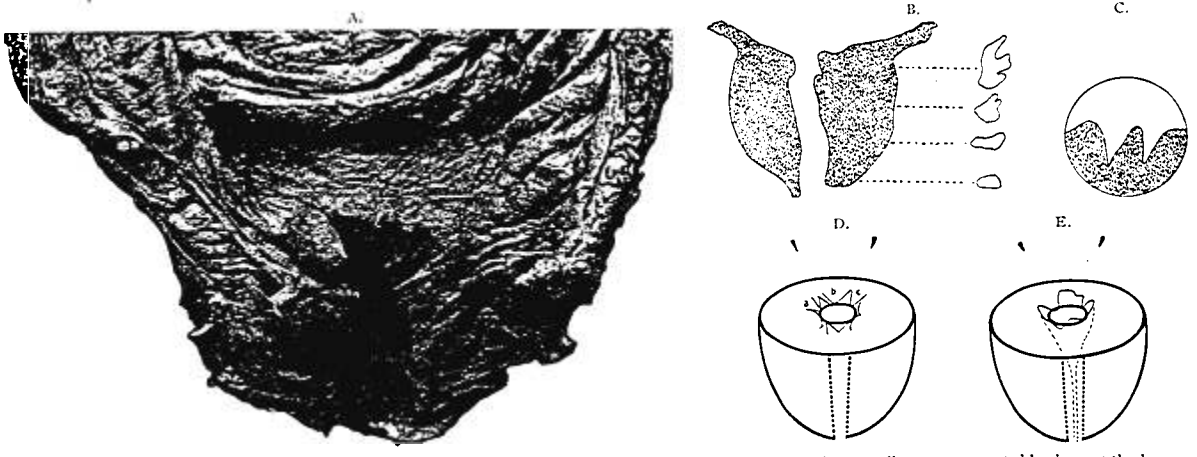
Enlargement and Fusion of the Left Lateral Lobe and the Median Lobe (Plate VII).—As seen in the illustrated case, the left lateral lobe and the median lobe are moderately hypertrophied and fused with one another. The right lateral lobe is also slightly enlarged. The urethral channel passes to the right of the median lobe, where it terminates in a cleft.

A similar somewhat smaller cleft in the anterior median

PLATE VIII.

IRREGULAR HYPERTROPHY OF THE MEDIAN LOBE.

A. Photographed specimen. B. Mesial section of the prostate and cross-sections of the prostatic urethra. C. Cystoscopic picture of the two left clefts. D. Diagrammatic record of the urethral clefts. E. The actual shape of the vesical outlet and prostatic urethra.



A. Photographed specimen of a prostate with irregular hypertrophy of the middle lobe. There are three small tumors separated by deep urethral clefts. The bases of the tumors are on the vesical surface of the gland and the apices of the urethra, each tumor forming an irregular cone, between which the urethra is split into three distinct clefts.

B. Mesial section of the prostate and cross-section of the prostatic urethra. The mesial section fails to show the cone-shaped hypertrophies seen in the photograph. The cross-sections give a diagrammatic idea of the irregular shape of the urethra at the different levels.

C. The cystoscopic picture of the two left urethral clefts formed by the cone-shaped hypertrophies.

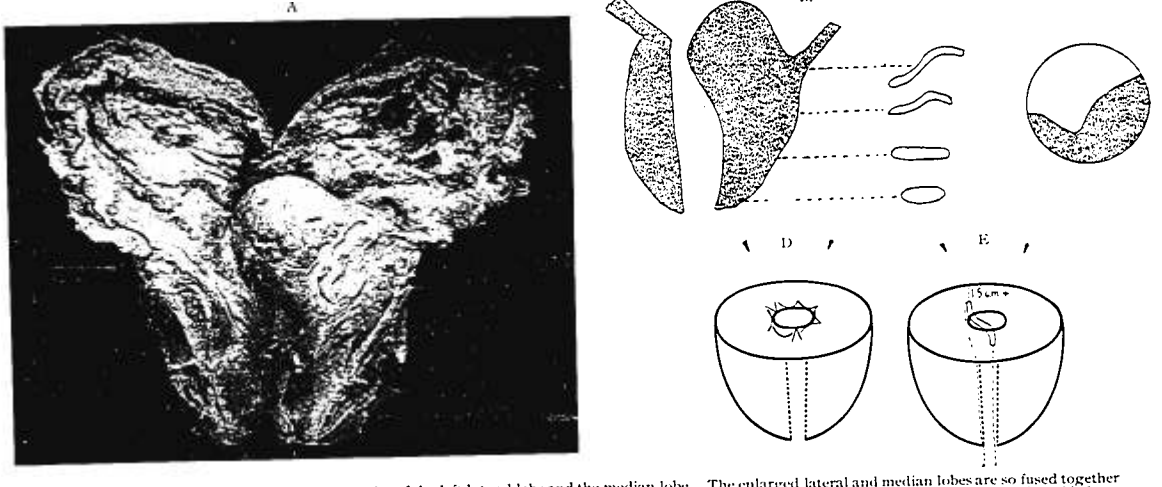
D. A diagrammatic record of the different cystoscopic fields of the vesical orifice, showing the three urethral clefts posterially, *a*, *b*, *c*.

E. The actual shape of the vesical orifice and the prostatic urethra determined by transposing the inverted cystoscopic pictures of D.

PLATE VII.

ENLARGEMENT AND FUSION OF THE LEFT LATERAL LOBE AND THE MEDIAN LOBE.

A. Photographed specimen. B. Mesial section of the prostate and cross-sections of the prostatic urethra. C. The cystoscopic picture of the urethral cleft to the left of the median lobe. D. Diagram of the urethral clefts. E. The actual shape of the vesical outlet and prostatic urethra.



A. Photograph of a prostate with hypertrophy of the left lateral lobe and the median lobe. The enlarged lateral and median lobes are so fused together that one cannot be distinguished from the other. The right lateral lobe, however, is evident, the deflection of the urethra to the right and the sigmoid shape of the vesical outlet is distinct.

B. Mesial section of the prostate and cross-sections of the prostatic urethra at different levels. The mesial section shows the large amount of tissue posterior to the urethra from the enlarged posterior lobes, and also the encroachment of this median lobe upon the upper part of the urethra. Below, the urethra is dilated anteroposteriorly from the pressure of the lateral lobes. The cross-sections show the shape of the dilated urethra.

C. The cystoscopic picture of the right urethral cleft. A smaller cleft is also seen at the anterior median border of the vesical outlet.

D. A diagrammatic record of the different cystoscopic fields of the vesical surface. A cleft is seen to the right of the posterior median line, formed by pushing to the right of the urethra by the median lobe. The anterior cleft is due to the pressure of the enlarged lateral lobes.

E. The actual shape of the vesical orifice and prostatic urethra determined by transposing the inverted cystoscopic pictures of D. The upper part of the urethra is sigmoid in shape from the pressure of the middle and left lateral lobe. The lower part is dilated anteroposteriorly from the pressure of the lateral lobes. The prostatic urethra is lengthened.

line will give evidence of the sigmoid-shaped vesical outlet (Plate VII, A, B, D, E).

(1) *Passage of the Cystoscope into the Bladder.*—As the instrument meets the lowest point of projection of the median lobe into the urethra, it will be deflected to the right, and will enter the bladder through the cleft at the right of the median lobe.

(2) *Observing the Appearance of the Bladder Outlet.*—The various cystoscopic views will determine the presence of a cleft at the right side of the median lobe and another in the anterior median line (Plate VII, A, C, D, E). Some degree of intravesical projection of the median lobe is evident by the small shadow cast upon the bladder wall.

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—When the beak of the cystoscope, or the writer's special instrument, is made to assume a posterior position on the vesical surface of the gland, it will be situated in the cleft at the right of the median lobe. The tissue posteriorly is increased in thickness. The median raphe is obliterated in the upper half of the gland, but is evident below this point. The length of the prostatic urethra is increased. In rotating the instrument over the vesical surface, some idea of the intravesical projection and width of the median lobe is determined. In withdrawing the instrument, the beak will be found to rotate to the right until it passes the lowest point of projection of the median lobe, where it will rotate to the median line and remain so throughout the remainder of the prostatic urethra.

Irregular Hypertrophy of the Median Lobe (Plate VIII).—This condition, seen in Plate VIII, A, is very unusual. The area usually the site of median lobe enlargement presents three small tumors, which project into the upper part of the prostatic urethra, and which are separated from one another by distinct urethral clefts.

(1) *Passage of the Instrument into the Bladder.*—The cystoscope in its passage through the prostatic urethra will enter one of the three clefts, and thus pass into the bladder.

The beak of the instrument will be deviated in a direction dependent upon the cleft through which it passes.

(2) *Observing the Appearance of the Bladder Outlet.*—Each urethral cleft appears distinct with the cystoscope, and by recording their location the shape of the vesical orifice becomes evident (Plate VIII, D, E).

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—When the beak is made to point posteriorly and to assume a position on the vesical surface of the gland, it will be in one of the clefts. The tissue posterior to the urethra at this point in this special case is increased. The rectal finger distinguishes no median raphe, and no evidence of the irregular hypertrophies is demonstrable on the posterior surface of the gland. In the case illustrated, there is no lengthening of the prostatic urethra. In rotating the instrument over the vesical surface of the gland, it is necessary to depress its distal end to make it pass from one cleft to the other, and, as it does so, the largest tumor is felt to slip by the shaft of the instrument. In withdrawing the instrument, the beak will deviate in the direction of the cleft through which it is withdrawn.

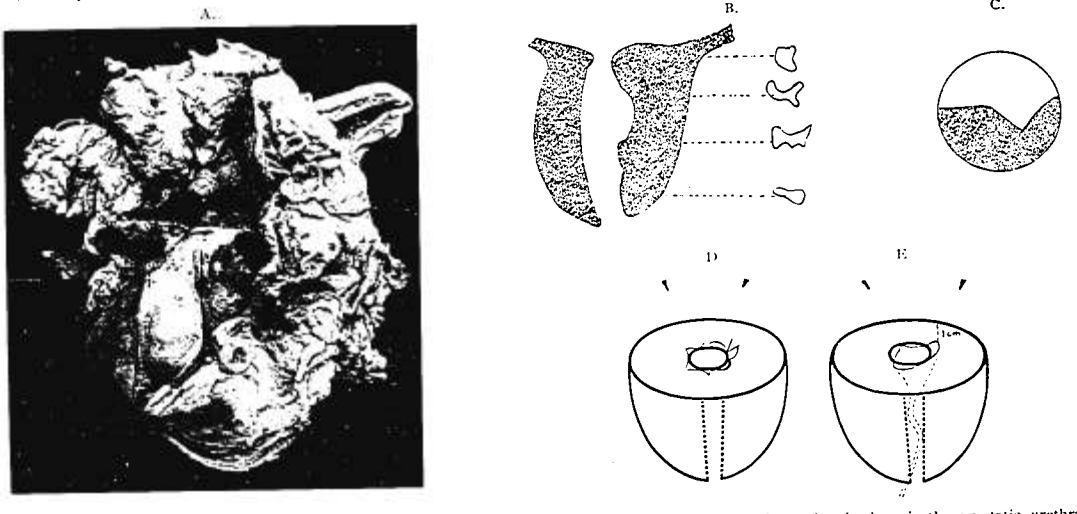
Nodular Hypertrophies Projecting into the Urethra (Plate IX).—Prostatic obstruction due to this form of hypertrophy, although rare, should not be overlooked, and proper skill in the examination should detect the character and site of such prostatic obstruction. As seen in Plate IX, A, the gland is not much enlarged, nor is the vesical outlet distorted as in the usual manner of the more common forms of prostatic hypertrophy. It will be seen that the course of the urethra is tortuous and irregular in its distortion. This is due to nodules, submucous and intramural, projecting into the prostatic urethra. The presence, however, of a nodule at the site of the median-lobe hypertrophy forms a distinct urethral cleft posteriorly and to the left of the median line, and this, together with the other nodulous growths, has changed somewhat the shape of the vesical orifice (Plate IX, B, D, E).

(1) *Passage of the Cystoscope into the Bladder.*—This

PLATE IX.

NODULAR HYPERTROPHIES PROJECTING INTO THE URETHRA.

A. Photographed specimen. B. Mesial section of the prostate and cross-section of the prostatic urethra. C. Cystoscopic picture of left urethral cleft. D. Diagrammatic record of the various cystoscopic fields. E. The actual shape of the vesical orifice and prostatic urethra.



A. Photographed specimen of nodular hypertrophied areas projecting into the urethra. The chief obstruction is deep in the prostatic urethra, where there is a large intramural nodule pushing the urethra to the left, and a smaller one above it on the left, facing the urethra to the right, making it sigmoid in shape.

B. Mesial section of the prostate and cross-sections of the prostatic urethra at different levels. The urethra is seen irregularly dilated anteroposteriorly, and the cross-sections show also that the same irregular dilatation has taken place laterally.

C. The cystoscopic picture of the left urethral cleft formed by the forcing to the left of the urethra by the right intramural growth.

D. The diagrammatic record of the various cystoscopic fields of the vesical orifice, showing a cleft in the left posterior segment.

E. The actual shape of the vesical orifice and prostatic urethra determined by transposing the cystoscopic record of D. The tortuous urethra is due to the intramural nodules pushing into the urethra and dilating it in great part anteroposteriorly. It is also increased in length.

step in the examination is the most important in determining this form of prostatic obstruction. As the instrument's beak meets one of the nodular growths, it is deviated to one side, where it remains until it passes over the nodule, when it will again rotate to its former position or assume a new direction from the pressure of another nodule. There is increased resistance to the passage of the instrument during its passage over the nodules, and there may be distinct jumps not unlike that felt in urethral stricture when examining with a bougie à boulé.

In the case illustrated, the instrument enters the bladder with the beak rotated at an angle of about 45 degrees to the left; in other words, it enters through the cleft at the left of the median nodule (Plate IX, A).

(2) *Observing the Appearance of the Bladder Outlet.*—But a single cleft appears in the cystoscopic fields of vision. This and the remaining fields and the actual shape of the vesical orifice are seen in Plate IX (C, D, E).

(3) *Bimanual Examination with the Cystoscope in the Bladder and the Finger in the Rectum.*—The cystoscopic beak, when made to point posteriorly and lie against the vesical surface of the prostate, falls into the cleft at the left of the median nodule. The tissue posterior to the instrument is diminished in amount, while to the right of the cleft it is increased. No median raphe is demonstrable by the rectal finger, and the posterior surface of the gland is nodular. These nodules are hard. By rotating the instrument, no additional information regarding the character of the obstruction is gained. In withdrawing the instrument, the beak will deviate as during its introduction.

NOTE.—The case from which this specimen was taken was operated upon for vesical calculus and the stone removed through a suprapubic incision. The character of the prostatic obstruction was not known at that time. The size of the vesical orifice and the gland itself at this time did not seem to warrant its removal, and the patient's symptoms of obstruction to the outflow

of the urine were considered referable to the vesical calculus present. The symptoms, however, of obstruction persisted for a year following the operation, at which time the patient died.

There are other rare forms of distortion of the vesical outlet which may exist and form clefts of diagnostic significance.

Fig. 8 is an orifice distortion due to enlarged lateral lobes with slight hypertrophy of the prostatic tissue anterior to the urethra. Three clefts are formed, two anteriorly, one on either side of an anterior median joint, and one at the posterior median point.

Fig. 9 is an example of hyperplasia of the tissue of the same area, resembling the condition seen in the posterior lobe

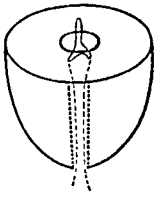


FIG. 8.

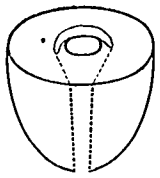


FIG. 9.

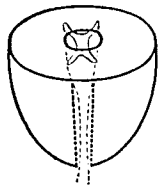


FIG. 10.

hypertrophies. There is a cleft formed at either end of the semilunar-shaped urethra.

Fig. 10 shows hypothetical hypertrophy of both lateral lobes, the posterior lobes, and the tissues anterior to the urethra, all producing distortion of the vesical orifice, and showing the existing clefts which are characteristic of their respective encroachments.

The various forms of hypertrophied prostatic tissue showing obstruction in the prostatic urethra, as evidenced by their characteristic distortions of the vesical orifice, have been noted, together with the discrete nodules projecting into the urethra.

It must be emphasized that the clefts seen by the indirect cystoscopes are inverted, that is, turned upon themselves, so

that to get a correct picture of the shape of the urethral orifice the clefts found must be transposed as illustrated in the plates.

1. *The Condition of the Remaining Portion of the Bladder and the Ureteral Orifices.*—The bladder will in most cases be either contracted or dilated, markedly trabeculated, or, if atonic, smooth with only slight trabeculation, with associated evidence of chronic cystitis. A *bas fond* of varying size will usually be present, and urinary incrustations and stones, so commonly associated with enlarged prostate, should not escape notice.

It is important to note the size of the interureteral bar and ureteral orifices which will give valuable information regarding the degree of the intravesical pressure.

Besides noting the size of the possibly dilated ureteral mouths, it is of importance to establish some idea of each kidney's secretory power by the rate of the ureteral ejaculation, when the conditions render this observation possible.

2. *The Comparative Size of the Various Lobes.*—Various cystoscopic views of the different lobes do not give a trustworthy idea of their respective sizes because of the absence of a sufficient degree of perspective. Some idea of the size of the intravesical growth may, however, be gained by carefully observing the density of the shadow cast by the edge of the prostate onto the surrounding bladder surface, and the relative position of the shadows with the interureteral bar and ureteral orifices. In order to gain approximate estimates of the comparative dimensions, both intravesically and laterally, one must resort to bimanual examination, as already described.

3. *The Length of the Prostatic Urethra.*—All forms of prostatic hypertrophy lengthen the prostatic urethra, especially the posterior enlargements. The determination of the degree of elongation is a very important point if a Bottini operation is to be performed. It is, perhaps, equally as important in influencing any given individual in choosing either the perineal or suprapubic routes for radical operation upon the gland. It may be learned by practising bimanual examination with the

cystoscope or upon the writer's specially devised instrument for this purpose. In using either device, the beak is brought snugly against the vesical surface, so that the tip points posteriorly. The finger in the rectum locates the tip of the instrument, and is then drawn outward over the posterior surface of the gland until the shaft of the instrument is felt as it protrudes from the apex of the prostate. By locating these two points on the instrument, the distance from the vesical surface of the gland to its apex is approximately determined.

This important distance is learned more accurately by the writer's previously mentioned instrument, which, having four grooves on the surface of the shaft, each one centimetre apart, beginning three centimetres from the beak, may be counted off by the finger in the rectum, and the beak being snug on the vesical surface, the length of the prostatic urethra is accurately determined in centimetres (Fig. 7).

METHODS OF RECORDING CYSTOSCOPIC EXAMINATIONS.

It is necessary to record with some degree of mathematical accuracy the various measurements of the abnormalities on the prostatic surface, the shape and size of the vesical orifice, and the length and shape of the prostatic urethra.

Cystoscopic photography may be of service in only a very few cases where small pedunculations are evident in a single cystoscopic field. To record the various cystoscopic fields even by the new Hirshmann or the Casper photographic cystoscope is far from practical, not only on account of the technical difficulties associated with the practice, but because of the unfavorable intravesical condition usually present in this class of cases.

Wax modelling, after the method advocated by Fenwick ("Electrical Illumination of the Bladder and Urethra," 1889, p. 85), may be used to indicate the intravesical condition of the prostatic surface and such distortions of the vesical outlet as may be evident. By this method, however, no information regarding the interurethral conditions can be recorded.

Moreover, the model cannot be constructed during the examination.

Diagrams.—At the meeting of the American Genito-Urinary Surgeons in 1903, Dr. Hugh Young, of Baltimore, demonstrated a new method of recording the appearance of the vesical orifices which is more satisfactory. The diagram upon which the record is made consists of a series of eight rings corresponding to the same number of cystoscopic fields, arranged side by side in the form of a circle. By rotating the cystoscope around the circumference of the bladder outlet and recording each picture in its diagrammatic field, an exact impression is made of the existing condition of the vesical orifice. The pictures thus recorded are, of course, inverted, and an accurate idea of the shape of the vesical orifice is not obtained until the outlines recorded in the respective fields are turned upon themselves, and the shape of the vesical orifice reconstructed in the mind of the operator.

Young's method, like Fenwick's, only enables one to systematically record the condition of the vesical surface of the prostate, and the former's method, being much more technical, is not intelligible to one unfamiliar with this practice.

It has been the writer's custom to record the condition of the vesical orifice by Young's method at the time of the examination, and, jotting down the dimensions of the various lobes and length of the prostatic urethra, to model the gland in waxed clay and file it with each case. This procedure requires considerable time and necessitates much clay.

With the idea of being able to diagrammatically record abnormal conditions existing in any part of the prostate gland, the writer has made accurate measurements of fifty normal prostates, from which a composite has been made as seen in last two diagrams of each illustrative plate.

The measurements taken for this purpose were the length from the vesical orifice to the tip of the prostate, the width of the vesical surface, the anteroposterior diameter of the vesical surface, and the vesical outlet, in its anterior and posterior

diameter. The distance from a centre point in the vesical orifice, and the lowest point of each ureteral orifice, and the width of the trigone from these points were also carefully estimated.

The diameters have been measured and recorded by von Frisch (*Nothnagel Specielle Path. u. Therap.*, 1889, xix, ii, iii, 4) and by Thompson ("The Diseases of the Prostate," 1883, p. 5), which figures correspond with those of the writer, as seen on page 614.

The length of the prostatic urethra as given by von Frisch is 33 to 45 millimetres (Thompson, 25 to 30 millimetres), [author's composite of fifty cases, 40 millimetres]. *Width of the vesical surface*, von Frisch, 34 to 51 millimetres (Thompson, 32 to 40 millimetres), [author, 47 millimetres, of this the vesical orifice in its greatest diameter averages 11 millimetres]. *Thickness*, von Frisch, 13 to 24 millimetres (Thompson, 20 to 25 millimetres), [author's composite, 24 millimetres, of which 13 millimetres was posterior and 11 anterior]. (The composite also shows the left ureteral orifice to be a greater distance from the central point of the vesical orifice than on the right. The left averages 24 millimetres, the right 22 millimetres. The ureteral orifices are apart from one another, 21 millimetres.)

From these measurements the average composite was formed, and made in the form of a stamp. Taking the normal diagrammatic outline, any abnormal conditions may be recorded with pencil at the time of the examination, illustrative examples of which are seen in the last two diagrams of each plate.

In conclusion, I wish to express my thanks to Dr. Abner Post, Dr. Francis S. Watson, and Dr. Paul Thorndike for the privilege of cystoscoping cases while serving as House Surgeon to their wards at the Boston City Hospital.

The writer is also indebted to Dr. Hugh Young for showing him, late in the year 1902, his method of recording cystoscopic views of the prostate. This systematic method has been of much service in making diagrammatic studies of the early cases.

The specimens of Plates II, III, IV, V, VI, and VIII are the property of Dr. Francis S. Watson, and have been published in his admirable monograph of 1888, already referred to. I wish to express my appreciation of his courtesy in allowing me to make use of them in this study.

NOTE.—Since writing this paper, Dr. Young has published a more complete account of his method of recording cystoscopic examinations of the prostate (*Johns Hopkins Hospital Bulletin*, November, 1904, p. 348).